STATE OF CALIFORNIA

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First Draft Report on the Methodology to Identify State Conservation Priorities

California Continuing Resources Investment Strategy Project (CCRISP)

The Resources Agency
April 2, 2001

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Identify State Conservation Priorities

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Executive Summary

California's rich heritage of resources is facing an array of problems that cannot be solved with our current approaches to conservation. This is why a statewide resource investment strategy is needed. There are complex problems involved in developing such a strategy and the criteria that a good methodology for setting conservation priorities must meet. This report defines and details the problem that CCRISP is designed to solve and the methodological framework and tools that must be developed to address the problem. The paper separates out the roles of scientist, expert, stakeholder and decisionmaker in the conservation priorities setting process. The methodology selected emphasizes the role of long-term sustainability and making existing dollars go further. It defines the geographic units that can be addressed on a statewide basis and the substantial data needs associated developing CCRISP data at different scales including the state level, ecoregions, major watershed and counties. The paper discusses the implementation of CCRISP from the narrower and limited project near term project to the broader complete project. Specifying the conservation priorities methodology is one of the key steps towards at least four major products:

- CCRISP will provide better information, better predictive models, more timely understanding of pending threats to conservation resources and more transparent, user friendly decision-support models that are widely available to allow the State and its conservation partners to make more informed decisions about where and how to allocate conservation resources.

- CCRISP will provide the venue, the experts and the tools for stakeholders and decisionmakers, for public and private organizations to have a better consensus and more information about conservation lands and natural resources of statewide significance.

- CCRISP will assist decisionmakers in making more efficient and effective conservation funding allocation decisions for land and natural resources conservation and stewardship.

- CCRISP will provide the opportunity to take on larger conservation projects with the cooperation and pooling of planning, protection and stewardship resources by many different public and private actors.

I. Preface: Why California Needs a Resource Investment Strategy

The Importance of California's Lands and Natural Resources

California's environment is the natural capital that underpins California's economy. This rich and diverse natural environment in California is of nationwide and worldwide importance. California has more plant and animal species than any other state. However it also notes that the state also has more species listed as threatened or endangered than in any other state in the Union, except Hawaii.

Long known for its visual beauty, California is a cornucopia of species and distinct bioregions. From coastal sage to riparian forests, from temperate rainforests in the north to the scorching Mojave Desert to the east, from rugged Alpine meadows to the waterways and sloughs of the Bay Delta, California harbors more native animals and plants – and more imperiled native species – than any other state in the nation.

California may be one of the most biologically diverse areas in the world, but that extraordinary diversity is being lost in many important habitats throughout the state. Over 20 percent of the naturally occurring species of amphibians, reptiles, birds, and mammals, are classified as endangered, threatened, or "of special concern" by state and federal agencies. As of February 1, 2001, exactly 276 Californian species were listed as either threatened or endangered.

These natural systems, both so rich and so at risk, are valuable, in part for the resources, services and materials – clean air, clean water, power, food, fiber, etc. -- that they provide to the State's economy. But they are also equally valuable in terms of the quality of life they afford: the amenities they provide, the recreational opportunities they offer, the opportunity for nature study in which so many Americans are involved, and the sense of natural heritage that these natural systems promote. Quality of life has been an important component of California's economic growth, contributes to its vitality, and induces new companies and increasing numbers of individuals to come to California. This quality of life and the underlying natural systems now face its most dire challenge.

Future Forces Affecting California's Lands and Natural Resources

California will most likely add somewhere between 9 and 11 million new residents during the next 19 years, bringing the State's 2020 population to about 45 million people. The State's population could easily exceed 60 million people by 2050. Population forecasters generally agree on the accuracy of these projections absent a major economic or natural disaster.

In addition to population growth, California's important lands and natural resources are facing other challenges. Native species are being replaced by invasive exotics at an unprecedented rate. Environmental pollution, both water and air impact the quality and health of resources. Expected climate change over the next fifty years will produce marked changes in California's landscape, outrunning any concerted worldwide efforts

to stem fossil fuel emissions. Clearly California is facing a host of conservation issues. Some require protection from development, others requiring significantly different solutions.

There are also many specific resource-related challenges facing California. Some of these key issues are discussed below

Parks

More people in California means increased more need for parks. Given projected population growth, the State must obtain access to a minimum of 2,376,000 additional acres of recreational and park space. The greatest need for parkland will be in urban centers already badly underserved by parks. In order to create new parks in and around metropolitan areas, costly land must be acquired. Some of that land will need to be restored to its natural condition; other lands will need to be turned from brownfields into greenfields.

The challenge will be the finding the right balance between saving large ecosystems that are still intact, saving significant parts of ecosystems remaining near or in metropolitan areas and re-creating those urban ecosystems that can be of benefit to urban communities as pockets and corridors of nature in the heart of the city.

Public Safety

The continuing expansion of urban and rural residential areas into California's wildlands interferes with the role that flood and fire play naturally in California. As more people move into formerly wild areas, the danger – and expense – of wildfires and floods increases dramatically. When forested areas are not allowed to burn because people live nearby, the results can be tragic. Witness the fires in the Los Alamos, New Mexico area in the summer of 2000. As more development covers watersheds that used to sop up rain like a sponge, more floods follow, bringing more damage to private and public property, as well as to natural systems.

Preserving Habitat

Many of California's varied and biologically important landscapes, whether publicly or privately owned, are not being protected and managed for their habitat value. A prudent policy to ensure the long-term preservation of California's unique biological diversity would protect some fraction of *all* habitat types in a connected system of reserves. Public private management agreement could also encourage private landowners to protect, restore and steward significant habitats.

Estimates of the additional amount of land needed for a system of conservation reserves in California range from 800,000 to 1,800,000 acres. However, there is no statewide conservation plan suggesting how such reserves should be located within the

ecoregions of the state, or how they should connect to other types of conservation lands and areas for growth.

Preserving Agricultural Land and Ranchlands

California is losing agricultural and open space at the rate of 6 acres an hour, every hour of every day -- 50,000 acres each year. These conversion rates are expected to continue into the future and will likely increase as population increases continue. Furthermore development on prime agricultural lands is shifting more intensive agriculture into foothills that were formerly grazing lands and habitat.

At present, nearly 16 million acres (over 50%) of the State's farmland, ranchland and open space land is currently protected because owners have accepted temporary restrictions on development under the Williamson Act for reduced property tax assessments. Given the inevitable pressure to convert agricultural land in the face of population growth, new solutions must be identified if California is to remain an agricultural state.

Wetlands

California has lost over 90% of its original wetlands acreage - more than any other state in the nation. This loss is particularly costly because wetlands are among the most productive and valuable ecosystems in the world. They produce high levels of oxygen, filter toxic chemicals out of water, reduce flooding and erosion, recharge groundwater supplies, provide critical habitat for fish and wildlife and a wide range of recreational opportunities from fishing and boating to photography. Protection of existing wetlands and restoration of damaged wetlands is a high priority resource investment.

Declining Forestlands

Close to 20,000 acres of forestland are fragmented each year as urban and suburban development takes place in formerly large contiguous forest areas. The recent surge in vineyard expansion is also cutting into coastal and foothill forests. In addition, some of our most unique forest types are facing growing problems from the spread of pitch canker and sudden oak death.

The health of the State's vast forests is a crucial element in California's economic and environmental future. Investment in these lands will result in long-term benefits for fish and wildlife as well as provide timber resources

CCRISP: Conservation Based on Science, Economics and Judgment

Even a cursory examination of the problems facing California indicates that the scale of the problems we are facing requires the full range of natural and social sciences to be brought to bear on determining how, when and where to protect California's natural resources. This is why the CCRISP is bringing the best experts in conservation biology,

urban planning and forecasting, aquatic ecology, information technology, decision science and resource economics to help us to understand how to bring the cost, benefits and risks of different conservation choices into the equation. Combining these disciplines will also allow us to be able to know: (1) where the high priority resources are throughout the state; and (2) the relative long-term costs and benefits of addressing these different high priority resources. Fortunately, science is progressing rapidly and will be able to help the State Legislature, the Administration and the resource agencies do a better job of allocating limited financial resources wisely.

Science alone will not answer the most pressing questions. Solutions will require a complex balancing of competing needs and investments. The current system of extracting mitigations on a project by project under NEPA and CEQA fails to provide coherent strategies. And even habitat conservation plans (HCP) and Natural Communities Conservation Plans (NCCP), while providing regional forums for balancing development and protection, do not attempt to match public and private financial resources available for conservation with a system of statewide conservation priorities. That is what CCRISP is designed to do.

The Legislative History of CCRISP

The California Continuing Resource Investment Strategy Project (CCRISP) was initiated by Assembly member Virginia Strom-Martin through a budget amendment to "*add $1 million dollars to Fiscal Year 1999-2000 …to be used by the Secretary for Resources for the development and publishing of a statewide Conservation and habitat blueprint*." Governor Gray Davis modified the budget to $250,000 to spend the first year developing a "*detailed strategy on how to best obtain a statewide assessment of the State's natural resources and habitat, and develop a long term set of priorities and targets for future investment and habitat acquisition and preservation*". Subsequent to the passage of the budget, Mary Nichols, Secretary for Resources embarked on a series of dialogues in a number of venues, including one sponsored by Californians and the Land and another sponsored by the California Environmental Dialogue.

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Prior Activities Related to and For CCRISP

Appendix A summarizes the development of the scope of work and other products during FY 1999-2000, as well as the outreach program that helped develop those products. It also summarizes the budget and actual expenditures made that year. Appendix B is a brief discussion of the implications of the Resource Assessment Project, (RAP) for the CCRISP methodology. RAP was a short-term project during FY 2000-2001 to develop a simple "pilot" methodology to allocate the substantial funds to be allocated to the states from the passage of the Conservation and Reinvestment Act (CARA). Although the funding actually passed by Congress was substantially less than that expected, the RAP project provided many lessons for CCRISP.

II. Steps Taken to Develop CCRISP First Draft Conservation Priorities Methodology

The funding was released for CCRISP and the list of products to be delivered to the Legislative Analyst Office (LAO) was agreed to in late November 2000. At this point, the Resources Agency sought out the best natural scientists with the most experience in conservation planning in California and other parts of the world to organize and lead the effort to develop a CCRISP Conservation Priorities Methodology. After looking at several alternatives, we decided that the National Center for Ecological Analysis and Synthesis (NCEAS) offered a great opportunity for CCRISP. NCEAS functions under the auspices of the National Science Foundation and the University of California at Santa Barbara.[1]

The Resources Agency has asked the NCEAS Working Group to assemble the best current science used in conservation planning and to design a state-of-the-art CRISP Conservation Priorities Methodology. NCEAS responded with a proposal that would produce a draft methodology, begin definition and specification of the models, tools and data layers. CCRISP staff and consultants would then implement the methodology, using the tools along with a stakeholder/decisionmaker valuation process, to develop a first iteration set of conservation priorities. The NCEAS Working Group would monitor the application of the methodology and the first year results and then modify the methodology to correct for problems. The final methodology would be produced in October 2002.

The Center has developed an approach which includes assembling working groups of multidisciplinary scientists focused on a problem, led by a NCEAS associated Working Group Leader. Professor Frank Davis, a biogeographer and terrestrial ecologist with the Bren School of the Environment[2] and Dr. Greg Greenwood, Resources Agency Science Advisor formed a CCRISP Working Group. Dr. Sandy Andelman, Deputy Director of NCEAS is a part of the working group and, along with Dr. Davis, is in charge of organizing the multi-day working group meetings and working with the research and administrative staff hired by NCEAS to do supporting research and coordination for the CCRISP Working Group.

The NCEAS Working Group has provided a great deal of thoughtful work in a short period of time to jumpstart this project. The membership of the working group is continuing to develop as the focus of the methodology has become clearer. NCEAS has been and will continue to identify the best national and international experts in the natural, social, economic sciences, systems modeling, policy science, decision science and geographic information technology to be part of a core working group, and others to consult on specific topics.

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[1] For more information about NCEAS, go to http://www.nceas.ucsb.edu/fmt/doc?/frames.html

[2] For more information about the CCRISP Working Group Leader, Dr. Frank Davis, go to http://www.bren.ucsb.edu/fac_staff/fac/davis/default.html

Challenges and Criteria for the CCRISP Methodology

Challenges That the Methodology Must Address

While the natural and social sciences involved in statewide conservation planning and landscape ecology has progressed substantially in the last decade, it has also made the complexity of interactions within the natural world much greater. In addition the number of different influences that are manmade or related to human actions or changes in the environment have multiplied and there is much more possible change and risk to the environment to consider. This makes creating a conservation priorities methodology for a Resource Investment Strategy a very large undertaking, pushing both the science and the way that public policy and decisions are made to a new level. So, the multi-dimensional complexity of the problem and imperfect information to understand the solution to the problem adds to the challenge.

Secondly, we know that the best science cannot solve the problem of creating resource conservation investment priorities for California. Value judgments are implicit in devising allocation systems. In order to succeed, the value judgments must become explicit and key stakeholders and decisionmakers must participate in making those judgments and seeing the consequences. As a result, CCRISP requires a methodology to provide the relationship between the information about conservation resources and choices, and let the value judgments be made by decisionmakers.

Third, there are enormous challenges in integrating of necessary information that has been collected by a wide variety of entities. There are conflicts in formats, boundaries, definitions, scale and quality of data between state agencies; similar conflicts arise between state, federal, regional, local agencies and special districts and between private and university research information. In the short term, the CCRISP Conservation Priorities Methodology should use the best available, consistent and unbiased data for the initial iterations. Investments in improved information and information sharing technology will be made cooperatively with other partners when future, more detailed iterations are conducted.

Despite the fact that the financial resources committed to this project by the State over the six years of project development are substantial, the Resources Agency will still need to augment those resources to implement this methodology and the resource assessment methodology. We will do that by bringing in federal, state and regional conservation partners to contribute in kind services or funds. We will also partner with the private sector, encouraging the development of a new generation of geographic information systems tied to decision support models. Finally we will seek private foundation grant funding and partnerships with the nonprofit conservation research community, and the University of California. Student research will play a large role in CCRISP and will benefit the University, the students and the CCRISP Project.

Criteria and Objectives for the CCRISP Conservation Priorities Methodology

- As discussed above, the process of methodology development will be iterative. In each iteration, the methodology will be applied, reviewed, improved and reapplied. The objective of this iterative process is to incrementally improve the information, the science and the way it is applied to state resource investment decisions. It is also intended to incrementally improve the techniques of decision science so that it can be used to make the consequences of different choices clearer to stakeholders and decisionmakers.

- The methodology must provide the capacity to develop and integrate new models that better reflect the complexity of the problem and the needs of the Administration and Legislature in making decisions.

- As discussed above, the methodology must integrate participation techniques and new decision support tools so that decisionmakers can actively participate in making the judgments that underlie the models and selected data

- The methodology must have the ability to input variable value judgments. Once decisionmakers can understand the consequences of one set of value judgments, they must be able to try changing those value judgments underlying the model until there is adequate agreement that the limited funds available to fund conservation objectives are spent on the highest priorities with the lowest cost.

- The Methodology for Conservation Priorities must be designed for the ultimate use of non-scientist decisionmakers. While scientists, other experts and stakeholders should have significant contributions to make to CCRISP, the primary end users of CCRISP will be the Administration, the Legislature, state departments with conservation missions, and public and private conservation partners that join in CCRISP. While there is some scientific expertise available to decisionmakers, most are not scientists, but lay people with public policy skills.

- The Methodology must include a way to define what types of places *are and are not a state priority for conservation*; that is a scientific and value judgment that should have input from stakeholders and decisionmakers.

- The Methodology must recognize that current legal mandates, administrative mandates, practices and decisionmaking processes of different agencies and departments matter. The tools and processes that are part of the methodology must build in the ability to be “customized” to

reflect the basic legal conservation mandates and missions of different departments and agencies.

- The Methodology must Include processes, and tools to resolve conflicts between different kinds of high priority conservation lands and natural resources.

- The Methodology must include the ability to identify conflicts between conservation objectives and other state and local objectives, including infrastructure needs and expected urban growth.

- The Methodology should address those conservation issues that we can forecast now with some degree of certainty (i.e. impacts of expected population growth, and urban development on and around conservation lands). It also must address problems that are uncertain but will affect or change conservation priorities. (i.e.. climate change).

- The Methodology must include evaluation tools for measuring the success of CCRISP on several levels:

    - A successful set of products that are effective tools,
    - A good knowledge base with reasonably accurate measures and appropriately detailed data for the scales chosen,
    - An effective analytical process with input from scientists and experts translated for use by lay decisionmakers
    - Decisions leading to improved protection of more high priority conservation lands and natural resources that maximizes the limited financial resources available to meet conservation objectives.

III The First Draft CCRISP Conservation Priorities Methodology

This is a formal methodology that uses specific terminology. Therefore it starts with a simple statement of the problem that CCRISP is to solve. It also defines some terms that will be used throughout this section. The second section describes the different types and scope of conservation lands and natural resources to be addressed by the CCRISP methodology. The third section presents the Methodological Framework in a flow chart and describes, using some examples, the kind of decisions this approach would address.

The fourth section describes, in more technical terms, the stages, tools and models (and what they are) applied in each stage of the methodology. The fifth section describes the involvement of stakeholders and the conflict resolution approaches necessary in each stage of this process. The sixth section discusses possible ways to define what is and is not a state level conservation priority. It also discusses the issue

of geographic scale and what role CCRISP can play at the ecoregional level and smaller geographic units.

Objectives, Terms and Definitions Used in the Methodology

The CCRISP Problem:

Since California's many unique landscapes will be strained by major land use changes, invasive species, and potentially major climatic changes over the next few decades, where should limited funds be invested and what form should these investments take now, so that California's lands and natural resources will maintain their uniqueness and vitality for present and future generations of Californians?

Definitions of Terminology Used in the Methodology

Biodiversity: Native biota (plants, animals and other organic life) that is diverse (many species) in natural communities or habitats. A wide variety of native biota in a habitat provides stability and the ability to survive change within a habitat.

Planning domain: The complete set of assessment units that could receive an allocation of resources for conservation purposes, ordinarily a geographic region. (e.g. the state, or regions within the state).

Assessment unit: A discrete subset of the planning domain to which conservation resources are allocated. A unit could be parcels, watersheds, or any other reasonable way of partitioning space. Allocation priorities can be very sensitive to the size and shape of the assessment units.

Conservation action: Specific practices that a) consume resources and b) lead to responses within assessment units. The list of relevant practices, identified at the outset but extendable over time, includes

- Acquisition of new public lands,
- Management (including restoration) of existing public lands,
- Stewardship arrangements (including conservation easements and land management contracts) with private landowners and resource management agencies.
- Planning assistance

Drivers: forces *outside* the control of the governing agency that affect the condition of natural assets, independent of, or in conjunction with, conservation actions. .

Action: If one considers certain drivers as in fact *under* policy control (i.e. the location and nature of urbanization), then that driver shifts into the **Action** category, and allow

the decision makers to consider the operation of such policies as alternatives to others (i.e. changing land use designations in lieu of acquisition.)

Examples of drivers or actions from the point of view of the State include urbanization, agricultural change, disease outbreaks, existing conservation efforts and climate change.

Causal relationship: In this report the manner in which a driver (or an action) changes conservation lands and natural resources

Statewide Conservation Objectives: In general a conservation objective is expressed as the maintenance or enhancement of a type of conservation land or natural resources that is considered to be of statewide importance. The scope of types of conservation lands and resources and the issue of statewide importance are discussed below.

Conservation priorities: a particular set of conservation actions in a particular geographic area that can meet a statewide conservation objective, and that have a high likelihood of achieving conservation objectives as compared to other conservation choices and a reasonable cost as compared to other conservation priorities.

Conservation partner: a private, nonprofit or government agency shares in the costs, provides services and collaborates to set and implement conservation priorities and resource stewardship.

Models: A description of a physical system that captures enough of the essential aspects of the system to allow the model to answer questions about the system and understand causal relationships within the system. In this case, models will be used to describe and prioritize conservation objectives by location, and to estimate how to allocate limited financial resources to conservation actions to maximize long terms benefits.

Data Layers: Data collected and organized by geographic location, so that there is a series of different types of data available in each of many locations, allowing one to compare one location to another.

The Definition and Scope of Natural Lands and Resources Addressed by CCRISP

CCRISP will be a strategic resource investment planning process for a full range of state priority natural lands and resources in California, including:

- Protecting and stewarding ***high priority biodiversity lands, freshwater aquatic ecosystems and wetlands;***

- Protecting ***prime agricultural lands*** for their current and potential resource production values and for their current and potentially natural resource values;

- Protecting ***rangelands*** for continued productive ranching and grazing areas and for protection of natural vegetation communities and ecosystems;

- Protecting ***forest lands*** for both sustainable timber value and for protection of the diversity of forest ecosystems;

- Protecting and stewarding ***natural lands that can sustain outdoor recreational and educational facilities and pursuits*** and can accommodate visitors in a natural setting;

- Protecting and stewarding ***sites with significant natural historical value*** (archaeological and paleontological resources);

- Protecting ***critical watershed values*** necessary to preserve ecosystem values in watersheds and the environmental quality to sustain those resources;

- Identifying and protecting existing ***significant urban open space natural values*** so that they can be healthy and sustainable over the long term, and restoring urban natural values of statewide concerns.

These multiple conservation objectives adds considerably to the challenge of CCRISP, but if these multiple objectives were not included, and CCRISP focused only on habitat protection for biodiversity, the variety of conservation lands and natural resources in California would not be fairly represented. CCRISP should be able to focus in on lands and resources that have multiple conservation assets (e.g. rangeland **and** biodiversity **and** critical watershed values **and** historic resources **nearby** an existing metropolitan area would be very high priority). CCRISP should be giving full information to decisionmakers on the tradeoffs between resources that are incompatible (e.g. loss of habitat when rangelands are converted to intensive agriculture, but increase in agricultural values).

These multiple conservation objectives are in line with the four main statewide conservation goals depicted in the recent report of the Legislative Analysts Office on The Role of State Conservancies.[3] The Resources Agency agrees with the idea that there should be a broad conservation planning program in California and thinks that the kind of specific strategic planning for investment called for under CCRISP is what is needed.

[3] Legislative Analyst's Office, ***California's Land Conservation Efforts: The Role of State Conservancies***, January 5, 2001, Page 4, Figure 2, Sacramento, California

Defining the Geographic Scale of Statewide Conservation Planning Under CCRISP

The beginning of this methodology proposed definitions for *planning domains* and *assessment unit.* These are the terms used by experts to define the geographic units and areas among which conservation priorities will be decided, and to define the specific areas to be designated for conservation action. The CCRISP Working Group at NCEAS has also made a preliminary proposal that it will test as the appropriate planning and assessment units for CCRISP.

While the funds allocated will be statewide funds, and the lands and natural resources of statewide importance, it is not yet clear exactly how the state itself will be a planning domain with regard to resources such as biodiversity. It will be extremely difficult to compare the conservation priority of redwood forest, coastal sage and desert habitat; they are all important parts of the state's natural heritage, with their own unique values. It is clearer that some version of the several different ecoregions definitions will be used as a planning domain. There are strong arguments that the sum of the ecoregions conservation objectives and priorities equal that of the State.

Major watersheds are also being considered as smaller units within which to set conservation priorities and recommend conservation actions. This will allow consideration of land/water interactions, the role of water in terrestrial ecology and the impacts of land activities on aquatic ecology.

Finally, the Secretary is asking CCRISP staff and the NCEAS Working Group to evaluate whether the data available in statewide or ecoregions wide data sets are accurate enough and "fine grained" enough to be used at the major watershed level, and be translated into political boundaries at the county level. It is very desirable to have data at the county level, so that the data becomes useful for other types of planning units (e.g. metropolitan planning organizations) built up from county level data.

CCRISP will not be providing decisionmaking information at the "transaction site" level. There is no doubt that there is not good enough data for CCRISP to do this; and that it is appropriate that it be done by the departments directly responsible for the transactions. The way in which CCRISP is used by agencies to make transaction level decisions, from the statewide, ecoregions and watersheds level information is still to be defined by scientists, the agencies themselves, stakeholders and decisionmakers

The Methodological Framework

The Stages of Conservation Planning

We have adopted the planning framework shown in Figure 1. It integrates the various stages, tools, and decision maker interactions necessary to guide the allocation

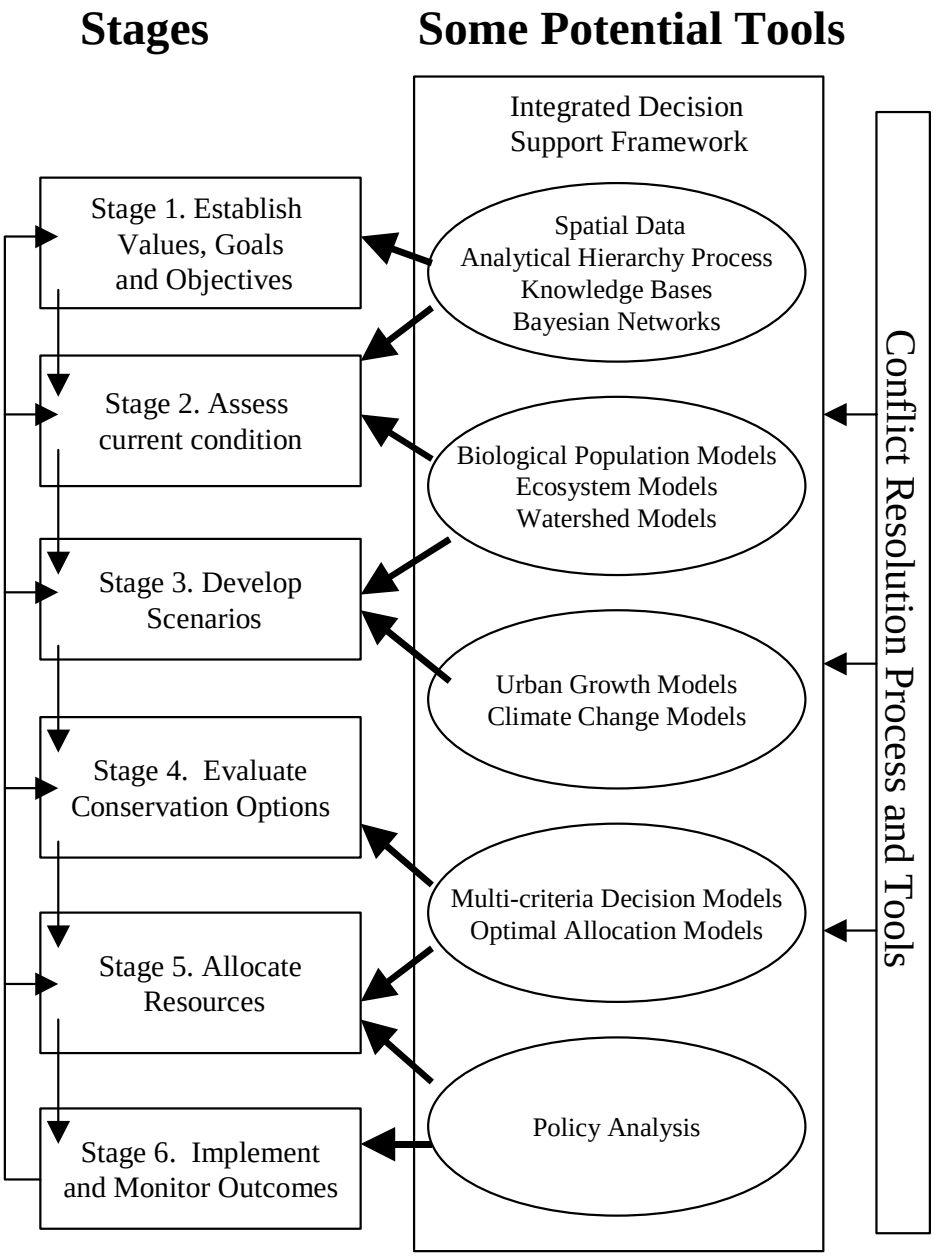

Figure 1. A Methodological Framework for CCRISP showing stages (which are iterative and repeatable at successively finer scales and examples of tools that will be used to support the planning process.

strategies that answer the CCRISP problem. In order to do that the methodological framework must address the geographical variation around the state, many different public goals, and expected changes in land use, vegetation, and water flows over the next few decades. The framework is modeled after a method developed by Harvard University Landscape Planner Carl Steinitz and most recently applied in California at Camp Pendelton and the surrounding areas in Orange and Riverside counties.

The process begins with the development of a measurable set of values, goals and objectives. This includes the definition of measurable criteria for these values, goals and objectives. A number of decision support tools are used to provide structure to spatial data, expert knowledge, and objectives to provide initial rankings. The purpose of these tools is to present the information to rank objectives clearly to non-scientist participants, and to help inform the choices made.

Additional information and models are used to identify current conditions and the threats to their stability and continued existence. Based on the goals and identified risks, various 'investment portfolios' of conservation actions across different actions and different locations are developed and evaluated.

After the conservation actions are reviewed, the highest ranked actions are proposed for implementation. A range of action plans with quantified levels of necessary investment, estimated returns, and estimated risk will be developed. A select "portfolio" of action plans (covering acquisitions, easements, and incentives) are developed from the larger range of action plans, and acted upon.

A portfolio consisting only of a collection of the most expensive actions (typically full title acquisition) may not work out to have the greatest long-term benefit. For example, a pure easement strategy within existing cattle ranches would prevent residential conversion but would be dependent on successfully managing the risk of best management grazing practices so that it complements, not undermines, desired land and aquatic species diversity. This approach has ecologically outperformed preserves without grazing in a number of vernal pool and annual grassland sites managed with the Nature Conservancy in the Sacramento Valley. Conversely, there are other examples where the risk of continued cattle grazing was not managed as effectively and led to an overall degradation in ecological conditions.

The goal of this method is to use information and value judgments developed in the first four stages (develop specific objectives, assess current conditions, forecast likely and alternative future scenarios and evaluate the range of conservation options), to get to the fifth stage: allocation of limited resources among conservation objectives. The methodological framework is intended to achieve a high long term cost effectiveness for the allocation decisions in light of the fact that current land uses and current environmental conditions will change substantially over the next few decades.

Throughout this process, new data, models for analyzing the data, and deliberations with the decision makers are used to continually refine the allocation plan. Figure 2

shows how this iterative process will work on an annual basis to get better and better answers to the CCRISP problem, repeated below, Since California's many unique landscapes will be strained by major land use changes, invasive species, and potentially major climatic changes over the next few decades, where should the limited funds available be invested and what form should they take now, so that California's lands and natural resources will maintain their uniqueness and vitality for present and future generations of Californians?

The Iterative Approach

We expect to complete an iteration of the full process within a year of this report. The first-year product will be based on a smaller set of data and a partially specified set of models as shown in the ellipses in Figure 1. By the end of the first year we expect to be able to provide a first-iteration conservation priority report to the Administration and the Legislature, which can be used to guide investment in conservation lands and natural resources. CCRISP will also be improving, correcting and making the methodology more robust, transparent and responsive to decision-maker needs, as shown in Figure 2.

Integrated Data Development, Forecasting and Decision Support Tools for CCRISP

The first set of decision tools will be used to represent logical reasoning, knowledge and preferences. In the context of CCRISP, knowledge bases provide a means for developing evidence supported by data for conservation objectives. For instance, the Santa Monica Mountains Conservancy and the Wildlife Conservation Board are two of the agencies that use the methodology of scoring systems to rate proposed acquisition projects. CCRISP will use knowledge bases to link together assertions regarding assets, drivers, actions, costs and weights to explore alternative logical reasoning assertions, different knowledge and preferences expressed by scientists and experts, stakeholders, and decisionmakers to build toward an evaluation of conservation actions.

The first four fundamental questions of CCRISP developed by the 1999 – 2000 Scoping Committee are oriented around important lines of evidence for conservation priorities:

What are California's significant lands and natural resources?
What are key emergent threats and opportunities to improve to our lands and natural resources?
What are the highest priorities for protection and restoration?
What is the most appropriate way to protect and restore these important, high priority lands and resources?

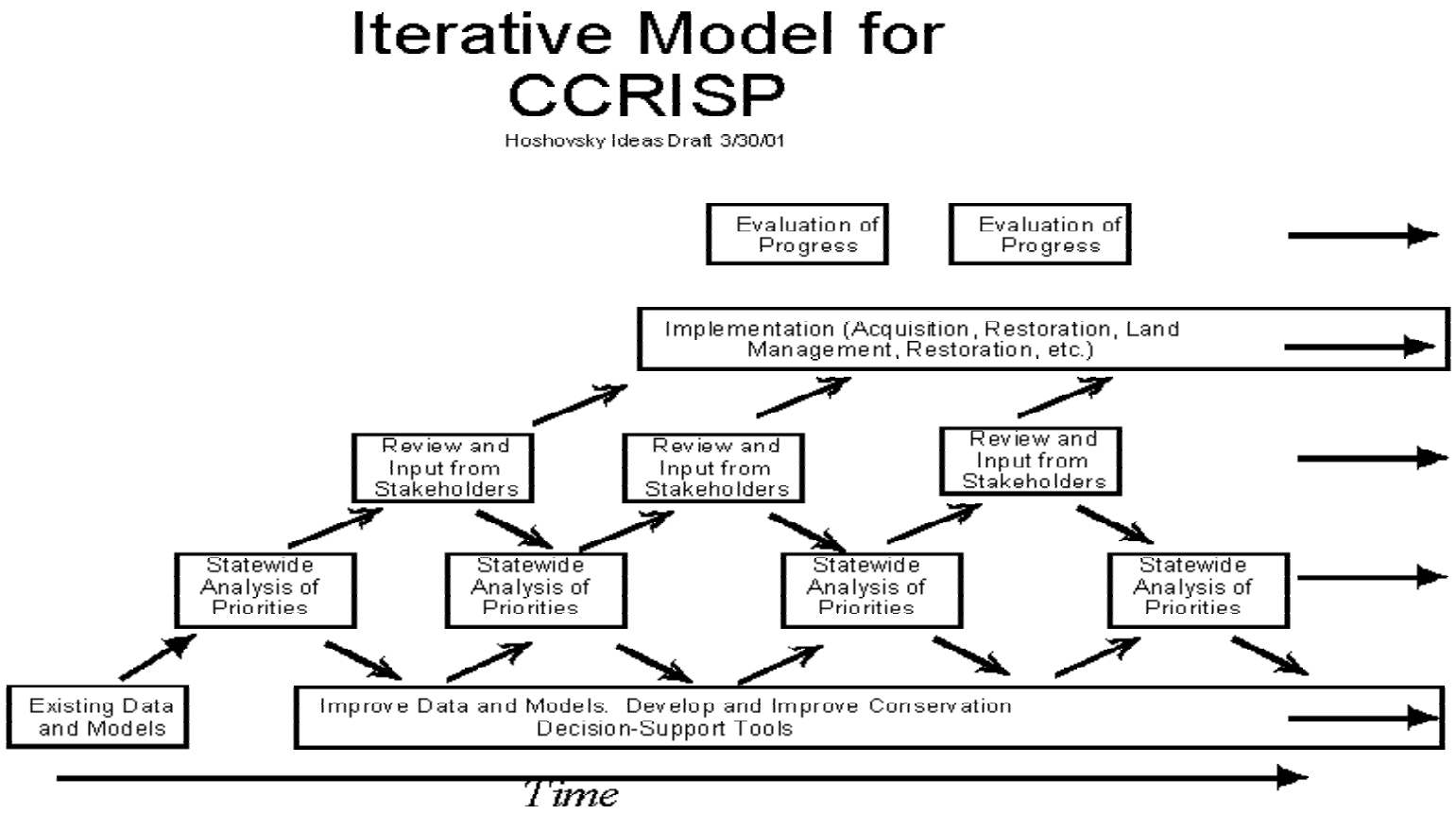

FIGURE 2: The Iterative Methodological Framework

What is an Analytical Hierarchy Process?

Analytical Hierarchy Process (AHP) is a rigorous method for helping people to explore and rank their preferences. In this case CCRISP will use AHP to engage managers, stakeholders and decision-makers in exploring and rank their preferences among conservation objectives in Stage 1 of the Methodological Framework.

The AHP has been compared to other hierarchical approaches for representing logical reasoning, knowledge and preferences such as Knowledge Bases and Bayesian Networks. These two classes of models are useful for integrating new information that comes from individual experts and from recent experiences into existing evaluation tools. These additional models could play an important role in analyzing new issues and insights that come up in the interactions with stakeholders and decision makers.

Knowledge bases provide a transparent and adaptable methodology to explore lines of evidence that contribute to making a decision. Knowledge bases complement analytical hierarchy processes by generating data related to objectives, which are ranked by AHP.

AHP has been selected as the preferred tool for this stage due to its relative simplicity and flexibility for evaluating multiple criteria and objectives. For more than twenty years AHP has been used successfully as a strategic planning tool in a wide range of applications. A simple representation of an analytical hierarchy is shown in Figure 3.

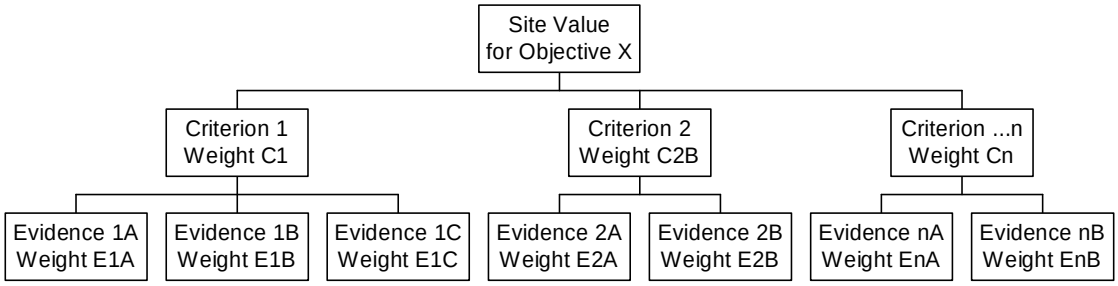

Figure 3. Hierarchical structure of evaluation in the Analytical Hierarchy Process.

In the example above, Criterion 1 could represent threatened species, Criterion 2 could represent under-represented natural habitats, Criterion 3 could represent the probability that the site will be surrounded by open space in 20 years, and so on. AHP allows for a consistent method of organizing the evidence and relative weightings as well as providing a site value for discrete sites. For example, a site with very high scores for the first two criteria may have a low overall rating if it is in an area zoned for development and adjacent to a key arterial freeway. Its overall conservation value would be lower than sites with less unique habitat scores but greater certainty of being surrounded by undeveloped parcels.

Knowledge Bases and Bayesian Networks

AHP will be compared to other hierarchical approaches for representing logical reasoning, knowledge and preferences such as Knowledge Bases and Bayesian Networks. These two classes of models are useful for integrating new information that comes from individual experts and from recent experiences into existing evaluation tools. These additional models could play an important role in analyzing new issues and insights that come up in the interactions with stakeholders and decision makers.

System Assessment Models

The evaluation models form the basis for an assessment of the current condition of each unit in the planning domain. This is the step where most of the detailed data layers and related information will be used in the process. Evidence for the assessment will include mapped observational data and information. Where strong information exists, process models that integrate ecological and hydrological processes will be included. Examples of these models that will be important are Habitat Range Models for species that will range far beyond any discrete reserve parcels, or for aquatic species, such as salmonid fish populations that are dependent at different times of the year on specific parts of larger watersheds. These models are especially important in evaluating attributes of assessment units under different scenarios of land use or climate change or under alternative investment strategies.

Conservation investments are typically made in anticipation of threats such as urban development. Urban growth models such as California Urban Futures Model (CURBA), developed by Professor John Landis at U. C. Berkeley, will be used to produce formal and spatially explicit scenarios of urbanization. However, such models will need to be substantially expanded to be useful to estimate where and how much development will occur in the future. In particular, the CURBA model and those other models developed for California that are similar to it, would need to add the following dimensions:

- Specification of the type of land use expansion expected instead of just "urban expansion; looking at residential uses, commercial, industrial and tourism needs may show a different pattern and distribution of future growth;
- Use of existing and planned infrastructure, particularly transportation corridors, as a indicator of the direction and distribution of new growth;
- Expansion of the model to include rural development and retirement-related development, both of which do not involve a large proportion of the population growth in California, but may have a profound influence on both the health and existence of conservation lands and natural resources.

There has been a great deal of work done about the effects of climate change in California. Scientists are surer of their results here, on the eastern edge of the Pacific Ocean, then they would be in other parts of North America. There are already climate

change models for California. The output from those models are beginning to be put together with output from ecosystems models and the output of development expansion models to give a more accurate picture as to how conservation lands and natural resources will be affected by the combination of these factors. So, output from climate models, urban/rural development expansion models and associated ecosystem response models will be used to assess sensitivity of the ecological attributes in a given assessment unit to combined projected climate change and development expansion. Results from these models, along with stakeholder input on model assumptions and values will result in alternative scenarios of change to conservation lands and natural resources.

Scenario Assessment, Multi-criteria Decision and Allocation Models

These are tools to help evaluate conservation options once alternate scenarios are developed. Multi-criteria decision models are used here because there are multiple conservation objectives within the scope of CCRISP described above. These models help to weight and make choices between very different kinds of conservation objectives.

Optimal allocation models will be developed within the overarching assessment framework to evaluate conservation actions and to guide the allocation of resources in Stages 4 and 5 of the CCRISP Methodological Framework. In general, optimization models follow the process below, finding the best conservation action to take to fulfill a conservation objective over a given period of time at the lowest cost. The significant value added by the optimization model is the ability to compare and contrast different conservation actions in different places by looking at their long-term sustainability (benefits) and their estimated cost. Resource economists and others have been able to develop ways of estimating the costs, however, significant work will be needed to develop adequate data sets on the costs of different actions among the diverse ecoregions in California.

Theoretically, solving the CCRISP Problem as an optimization means:

- Starting with an initial guess of what might be the best set of actions,
- Calculating the results of those actions together with the drivers on the assets on concern
- Summing the results (benefits and losses) on the assets, weighted by importance accorded each asset by the decision-makers
- Summing the costs of the actions
- Calculating the benefit:cost ratio (or some other criterion)
- Repeating with other sets of actions and keeping only sets of actions that give a higher criterion values
- Stopping when one concludes that one can do no better.

For example, a multi-criteria model could be run with different mixes of full acquisitions, easements, and incentives on discrete acres within a large habitat area that will

experience some residential conversion. The application of different allocations on different parcels will generate both total costs and a measurable pattern of habitat protection that can be scored against a standardized biological population model for the specific area (e.g. Bighorn sheep habitat that must include links between valley floor, foothill, and upper mountain areas). Utilizing a fixed amount of money to buy different levels of rights over different parcels will produce different scores that can be analyzed until no significantly better solution can be achieved.

CCRISP will not attempt to create a mega-optimization model to solve the conservation allocation problem in the state of California. Such a strategy is computationally, scientifically and institutionally impossible. CCRISP does propose, however, that various approximations to the optimization problem will provide useful information to knowledge bases used to allocate resources.

The Role of Experts, Non-Expert Stakeholders and Decisionmakers: Participation and Conflict Resolution in the Methodological Framework

This report will be the initial basis for beginning the outreach program for CCRISP. The Resources Agency has already begun to establish working relationships with existing organizations, particularly by involving the California Biodiversity Council[4] and its members in our work on assessing the data layers needed for CCRISP. Individual departments and agencies have contributed information to the legal mandates study that will be an input to the overall methodological framework for CCRISP.

Because CCRISP is ultimately a decisionmaking tool for allocating limited conservation funding, it is essential that the state's decisionmakers and their advisors be involved in the implementation of the CCRISP methodology. The Legislative Analyst, and representatives selected by the Legislature to represent their role as decisionmakers. The Resources Agency will ask them both how they would like to participate. The Governor's Office of Planning and Research and the Department of Finance will be asked to represent the Governor's office in participating in CCRISP.

Stakeholders who represent landowners, conservation groups, local and regional planning agencies and others with specific interests in the different conservation resources will be asked to work together to advise the Agency on the priorities within and across the various conservation land and natural resource types. They will be asked to evaluate each stage of the process and will be able to help us make the new decision support system tools useful for their purposes.

[4] The California Biodiversity Council (CBC) was formed in 1991 to improve coordination and cooperation between the various resource management and environmental protection organizations at federal, state, and local levels. The Council's purpose is to discuss, coordinate, and assist in developing strategies and complementary policies for conserving California's natural resources, plants and animals Their work has been focused on strengthening ties between local communities and government entities and agencies involved with the protection of biodiversity. Their major emphasis has been to provide education, promote strong local leadership and encourage comprehensive solutions to regional resource issues. The Council has 38 members, including 8 regional councils or associations of county supervisors and governments, 16 state agencies, 12 federal agencies, the University of California, and the California Association of Resource Conservation Districts.

Because there are so many different conservation objectives and so many different perspectives, there will be conflicts and disagreements on the values and weights that should be put on various components of each conservation objective and values and weights between conservation objectives. The new allocation models, multi-objective criteria models and decision support tools will help participants to see the results of different values and weights and bring clarity to the agreements and the disagreements.

CCRISP can be used, either to develop a short range allocation of a budget for conservation actions, or to evaluate recommendations from agencies, or to help the Legislature evaluate specific conservation actions, or to develop a long term resource investment strategy for California. Those stakeholders and constituents who care about these issues will have a role in the process and the product. They will be involved in forming the value judgments, will have the tools to understand the basic underpinnings of the CCRISP models, and will be able to recommend changes in values, weights and underlying assumptions that will change the conservation outcome. Thus CCRISP will inform the current decisionmaking process, making its values explicit and clear.

Defining what is and what is not a State-Level Conservation Priority

Inherent in allocating state dollars to specific conservation actions is the idea that the action merits state attention because it represents a value of statewide importance. Various state statutes have identified certain kinds of conservation, and certain parts of the state as being of statewide importance. And yet, in the budgetary process, the line between a local project and one of statewide importance is sometimes not clear.

CCRISP will need to have some basic ground rules to define a state-level conservation priority in order to start implementation of the methodology. The agency conservation partners, nonprofits, the steering committee of local government, private and nonprofit interest groups and decisionmakers representatives will help to define the line between “of statewide priority” and “Not of statewide priority”.

To provide an example of how basic ground rules will be established, the CCRISP Working Group at NCEAS developed the chart shown as Table 1. It provides the template, which will be filled as the work progresses.

Table One: A Template for Definition of Conservation Lands of State Importance

	Protect Open Space	Maintain Native Plants and Wildlife in places that sustain them			Conserving Primary Production Lands			Natural Lands for recreation	Critical Watershed Values and Functions
Spatia/ Institutiional Policy Scales		Biophysical: Topography, Aspect, Geology, Soils, Water	Native Species and Communities	Trust Species: Threatened or Endangered	Primary Farm Lands	Secondary Farm Lands	Timber Lands		Protecting Aquatic Habitat and Buffers for Habitat,Water Quality and Quantity
State/ Regional	Minimize state pre-emption or support of local open space priorities *<u>Unless</u> it is urban and has resources or restoration potential*	• Insure adequate representation of plants, animals, communities and biophysical features within and in the transition areas between specific ecoregions • Insure that there is a surrounding environment that supports or does not threaten species or communities Other (not yet specified)		Ensure Adequate Critical Habitat	• Geographical/biophysical representation • State responsibility to protect future production potential of prime farm and timber lands • provide hedging for restoration • Buffering for habitat and from urban development • Sustainable yield as a secondary goal • Economic yield of secondary prime lands and environmental effects of use			Provide facilities and programs in natural areas for overnight visitation, natural area	CCRISP focuses on Watershed protection and protection of natural processes that make riverine aquatic habitat and wetlands heathy
Substate	Prioritize as a regional or local goal	Local Responsibility under General Plans	Substate Option under the NCCP Program	Substate Responsibilit y Under CESA and ESA	Local Responsibility Under General Plan				Local responsibility under Clean Water Act for pollution/erosion

IV. Actions to be taken to Implement the Conservation Priorities Methodological Framework.

Data Development

The development of data on assets and drivers is a pre-requisite for solving the allocation problem via the models described in Figure 1 above. While not a particular subset of the problem, data development is of such overwhelming analytical and political importance that it bears some further discussion. The glib manner in which this report and others refers to conservation objectives such as maintaining native biota, etc. would seem to suggest that a single GIS layer either currently exists or could easily be made to reflect each value. The great challenge would seem to be in how one combined those data to infer conservation priorities. While the challenge of combining data to infer conservation priorities is considerable, the challenge of operationally defining the open space, maintenance of biota, primary productive lands, recreation and water supply and quality is at least as great.

For instance, ecology has yet to produce an uncontested theory of habitat value or ecological integrity. Instead these objectives or even the assets themselves can be viewed as assertions-'these areas are critical for the maintenance of native biota". These assertions are the judgments of different experts using different lines of evidence. While this is disappointing to those who expect these objectives to manifest themselves in a priori data inputs to the project, the operational definition of the objectives and building the connection of the objectives to measurable spatial data is, in fact, a major activity of CCRISP. While Appendix C has a broad listing of more data sets than CCRISP can use in the short term, it probably has less than half of the data sets that CCRISP will need in the long run for full implementation. Appendix C is a start on the report on Existing and Required Data Layers for CCRISP that is to be delivered to the Legislature on May 1.

Implementation of CCRISP in the Near Term

CCRISP has been proposed as an iterative program. This is an ongoing resource investment strategy that will take six years to fully build. However, CCRISP will not be waiting six years to complete all the stages of the methodological framework and fully develop all of the models, tools and data layers to recommend all kinds of conservation priorities and the full range of possible conservation actions. Rather, in the first year of implementation, CCRISP resources will be focused on the most controversial part of conservation decisionmaking: land acquisition: building on the work of the Resource Assessment Project (See Appendix B), the CCRISP staff, agencies, scientists, decisionmakers representatives and advisory groups will work together to develop a first-cut land acquisition priorities proposal.

So, in the near term, the Resources Agency will convene the scientists, experts, agency managers, stakeholders and decisionmaker representatives to focus on the goals, objectives and values related to only one type of conservation action: acquisition of fee

or less than fee title of land for conservation by public or private means. The Agency will ask the representatives to establish the basic ground rules or trade offs for dealing within and between multiple types of conservation lands and natural resources. The first year may not be sufficient to resolve all issues surrounding multiple conservation land types. Based on input from scientists and other participants, the project may focus on one or more conservation land and natural resource types in the first year. Alternatively, we will focus on all conservation land and natural resource types, but just look at one or two ecoregions in the state as a test case.

We will ask a subset of advisors to participate with our scientists in an Analytical Hierarchy Process for each major type of conservation land or natural resources, and then reviewing the results of that process with all participants. We will develop the data layers (knowledge base) to reflect both the available scientific knowledge and value judgments made in the above-described process. We will run existing ecosystems models, climate change models and forecasted urban growth models to develop alternative scenarios of conservation change. We will develop our optimal allocation model and rough cost data to implement it. We will begin the process providing the consequences of alternative allocations of limited conservation budgets to stakeholders and decisionmakers.

The Long Term CCRISP Project

As we move through yearly iterations of the project towards the completion of CCRISP development, we will add more refined scientific information, and more consensus on the values that should be placed on different conservation lands and natural resources. The models to describe our current status will improve, and will help to improve our projections of future scenarios. We will expand our ability to project the different types of development that will expand and the locations where it will expand, using both urban and rural development parameters. Climate Change and ecosystem response models will also improve as the data we already have expands and informs those models. We will refine our optimization models to some extent, and improve our cost data. We will expand the range of conservation actions from acquisition to public private stewardship agreements to improved public stewardship and restoration. We will improve the flexibility of the overall program to answer all of the questions raised by the Steering Committee. We will need to substantially expand our data, since we estimate our current data to be about 1/2 to 1/3 of the data sets that we will eventually need.

Appendix A
The Products and Costs Associated with
FY 1999-2000 CCRISP Program

Preparing the Framework

The "scoping "project for CCRISP was led by the Department of Fish and Game through an interagency agreement with the Resources Agency. Fish and Game worked with a multi-agency Core Staff Group and multi-stakeholder Steering Committee[5] from diverse background to develop the following products:

1. A Draft Mission Statement, Objectives and Goals for CCRISP

Mission: To develop and implement an improved and inclusive approach to conserving and restoring California's lands and natural resources.

Objective: To provide the tools and resources necessary to enable all Californians and California's partners in conservation to answer four fundamental questions:

- What are California's most important lands and natural resources?
- What are the highest priorities for protection?
- What are the most appropriate way to protect these important, high priority lands and resources?
- How effectively are the State of California and its partners in conservation implementing the strategic approach to conservation?

Values: In developing this strategic approach to conservation, we will:

- Form true partnerships with all of California's partners in conservation.
- Vigorously engage in discussions with *all* affected publics.
- Encourage efforts from top down *and* bottom up.
- Respect and enable local land-use planning authority.
- Support local conservation efforts and values.
- Recognize public and private property rights and responsibilities.
- Promote stewardship as a conservation ethic.
- Create incentives for landowners' stewardship of resources.

[5] Mary Nichols (Chair), Resources Agency; Martha Davis (Vice-Chair), Californians and the Land; Linda Arcularius, Inyo County; Lucy Blake, Sierra Business Council; David Diaz, US Forest Service R-5; Jim Edmondson, California Trout; Monica Florian, Irvine Company; Michael Heyman, Boalt Law School UC Berkeley; Steve Johnson, The Nature Conservancy; Jerry Harmon, SANDAG; Joan Hartmann, So. CA Wetlands Recovery Project; Diane Jacobs, Department of Fish and Game; Dennis Machida, California Tahoe Conservancy; Robert Meacher, Plumas County; Jovita Pajarillo, US Environmental Protection Agency; Carl Roundtree, Bureau of Land Management; Candace Skarlatos, Bank of America; Dan Siver, Endangered Habitats League; Nita Vail, California Rangeland Trust; Johanna Wald, Natural Resources Defense Council; Charles Warren, State Lands Commission (retired); Laurie Wayburn, Pacific Forest Trust.

The Role of Science: We will rely heavily on science – particularly earth, life, ecological, and social sciences – to guide our decisions. However, we will not allow a lack of scientific information to prevent us from making progress. Instead, we will make the best possible decision with the information available and considering the risks of being wrong.

2. A Detailed Work Plan and Set of Products for the Six Year Project

The work of the Core Staff Group and the Steering Committee was combined in a detailed scope of work, timeline and specific products for the six year time frame of the project.[6]

3. An Initial Data Review

The CCRISP Core Staff Committee and the California Biodiversity Coordinating Council began an inventory of data sets developed by state, federal agencies, nonprofit organizations, universities and research institutes.[7] This is one of the starting points for the analysis the types and quality of data layers now available, and identification of data gaps to be filled to meet CCRISP needs.

4. An Education and Outreach Program

The Education and Outreach Program began at the first meeting convened in July 1999 by Californians and the Land. It continued with the establishment of the Interdepartmental Core Staff Committee and the appointment of a Steering Committee of diverse stakeholders to help frame the project scope of work outlined as the product for Fiscal year 1999-2000. The project was described in ***Biodiversity News,*** the Newsletter of the federal/state/local California Biodiversity Council.

5. Expenditures in FY 1999- 2000

Approximately $182,801.of the $250,000 included in the 1999-2000 Budget was expended. The accrual of salary savings contributed to the unexpended balance in the account. [8]

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[6] **See** The Resources Agency. CCRISP ***Project Plan*** and ***Detailed Project Task and Product Time Chart***, September 13, 2000

[7] California Biodiversity Council Science Coordinating Committee, ***Initial Survey of Key Statewide Databases*****,** June 19, 2000 (draft)

[8] Department of Fish and Game, Year End Report, Fiscal Year 1999-2000, California Continuing Resource Investment Strategy project: November 13, 2000

Appendix B
The Resources Assessment Program (RAP) and CCRISP

The Resources Agency commissioned a simple methodology that could be developed, along with several data layers to assigning conservation priorities for biodiversity preservation and urban open space from the Resources Law Group. This was done to address the possible passage of federal land and water funds allocation to the state under the proposed Federal Conservation and Reinvestment Act (CARA) that was expected to release substantial funds from the federal Land and Water Conservation Fund to the state. The contractor worked with a team of multidisciplinary experts from the Resource Agency Departments to develop a simple methodology, collect and map some new data, and develop some key data layers that will be used by CCRISP. The project produced a report[9]

The results of the Resource Assessment Project and its recommendations provided many lessons that helped to make CCRISP's draft conservation priorities methodology better. A major contribution was the development of a set of improved and updated data layers, including a map showing all lands currently in state and federal ownership. High priority areas for protection of threatened and endangered species was developed with use of the Natural Diversity Data Base (NDDB). Another layer was developed with GAP Analysis data, showing areas that are "gaps" between existing protected areas that, if protected, would form larger, more intact ecological units. All natural areas within fifty miles of the major metropolitan areas were also mapped.

It should be noted that the authors of the RAP Process did not combine data layers into single conservation priorities map for biodiversity protection. They did not do so because they thought that additional steps needed to be taken prior to combining the data. They note that values and weighting must be used to set priorities and also used to combine the data layers into maps expressing priorities. There are other substantial challenges to combining the data layers into a single priorities map, particularly because each data layer represents a different aspect of biodiversity or value of biodiversity to human populations that cannot necessarily be simply layered one on top of the other. The authors also noted that setting priorities requires a process involving interaction and communication between experts, stakeholders and decisionmakers. They recommended that the next phase of conservation priorities involve such a process.

The recommendations made by the RAP team to improve these data layers are now being implemented through CCRISP by contract and with the assistance of the Science Advisor and the team of staff scientists and geographic information experts that worked on this project. Some of the layers will form a part of the data layers used for the first

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[9] Resources Law Group, *Completing the Puzzle: California's Unprotected Resources at a Millenial Crossroad*, A Report of the Resources Acquisition Planning Group. January 25, 2001

round of conservation priorities due to the Legislature in January 2002. Even without the data improvements, the Wildlife Conservation Board, the acquisition arm of the Department of Fish and Game is using their information to set acquisition priorities.

Appendix C

Initial CCRISP Data Needs Assessment to Implement the CCRISP Methodology on Conservation Priorities

To accomplish the wide scope of it's conservation objectives, CCRISP will need to run various models and analyses such as, for example, urban growth projections, areas at risk, areas of high biological significance, and effects of climate change. These models and analyses will require various types of data to produce meaningful results. This data can be characterized into three major categories: data on the resource values themselves; data about activities or drivers that affect these resources; and data about constraints and opportunities that affect the success of CCRISP and its partners in assuring long-term perpetuation of those resources. Within each of these major categories are a variety of important data themes. A limited review of statewide data reveals that data sets exist, in varying degrees of usefulness and quality, for at least those data themes marked with an asterisk (*) below. These are major theme categories, with many subdivisions possible within each theme. A more complete evaluation of data sets will be available in the separate report *Evaluating Key Date Sets that Have Been Identified*, due on May 1, 2001.

I. Resources

A. Natural Resources

1. Biological

a. Species
   (1) *Sensitive Terrestrial Species (T&E, other rare)
   (2) *Sensitive Fisheries (T&E, other rare)
   (3) *Terrestrial Game Species
   (4) *Inland Fish Harvest Species
   (5) *Common Animal Species
   (6) *Common Plant Species

b. Habitats
   (1) *Rare Terrestrial Habitats (including riparian)
   (2) *Rare Aquatic Habitats (including wetlands)
   (3) *All Vegetation Types
   (4) *All Aquatic Habitats (rivers, lakes, streams)
   (5) *Important Animal Movement Corridors
   (6) Important Wildlife Habitat Structural Elements (snags, cliffs, caves, etc.)

2. Water
a. *Water Quality
b. *Hydrography, including stream volume and flow rates
c. *Watershed Boundaries
d. *Flooding
e. *Water Supply
f. *Ground Water Recharge Areas
g. *Important Drinking Water Supply Areas

3. Soils
a. *Sensitive/Highly erodible Soils
b. *Soil Productivity
c. *All Soil Types

4. Timber/Range
a. *Timber Productivity
b. *Rangeland Productivity
c. *Wildland Fires

5. Geology
a. *Surface Geology
b. Rare or Important Geological Features
c. Important Paleontological Features
d. *Mineral Resource Areas

B. Cultural Resources
1. *Archaeological Resources

C. Recreation Resources
1. *Open Space

II. Activities or Drivers that Affect Natural Resources

A. *Land Use

B. *Planned Land-use (zoning, land-use plans, etc.)

C. *Roads

D. *Timber Harvest

E. *Water Impoundments and Diversions

F. *Invasive/Nuisance Species

G. Recreational Activities
   1. *Motorized Recreation

   2. Non-motorized Recreation
   a. *Hunting
   b. *Fishing
   c. Other Human Access to Wildlands (hiking, equestrian, rafting, etc.)

H. *Mining

I. *Grazing

J. *Water Pollution

K. *Air Pollution

L. *Toxics

III. Planning Constraints and Opportunities

A. *Land Ownership/Easements/Management Status, including parcel size

B. *Existing natural resource planning or management field projects

C. *Existing Local Natural Resource Institutions

D. *Remote Imagery (Satellite, Air photo)

E. *Administrative/Jurisdiction Boundaries (city, county, state, federal)

F. *Population Density

G. *Housing Density

H. *Topography

I. Geodetic Control

J. *Climate (Temperature and Rainfall)

K. *Educational Levels

L. *Employment Income